

REMARKS

Claims 55-75 are pending in the Application.

Claims 55-75 are rejected.

Claims 58-63, 68, 70, and 72 are cancelled herein without prejudice.

Claims 69, 71, and 73-75 are amended.

Claims 55-57, 64-67, 69, 71, 73-75 are pending in the Application after entry of the amendments herein.

I. REJECTIONS UNDER 35 U.S.C. § 102(a)/ § 103(a) OVER COLOMER

Examiner has rejected Claims 55-75 under 35 U.S.C. § 102(a) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as obvious over Colomer et al., "Synthesis of single-wall carbon nanotubes of by catalytic decomposition of hydrocarbons," *Chem. Commun.*, July, 1999, pp. 1343-1344, ("*Colomer*"). Office Action, at 2.

Applicant respectfully traverses these rejections. To facilitate prosecution, Applicant has cancelled Claims 58-63, 68, 70, and 72 herein without prejudice, and therefore rejections of these claims are moot.

As *Colomer* was published in July 1999, this reference is not prior art for any of the pending claims of the present Application.

This application is a division of co-pending prior division application Serial No. 09/830,642, filed July 1, 2002 (now United States Patent 6,761,870), which is the 35 U.S.C. § 371 national application of International Application Number PCT/US99/25702 filed on November 3, 1999, which designated the United States, claiming priority to provisional U.S. patent application Serial Numbers: 60/106,917, filed on November 3, 1998 ("the '917 Patent Application"); 60/114,588, filed December 31, 1998 ("the '588 Patent Application"); 60/117,287, filed January 26, 1999 ("the '287 Patent Application"); and 60/161,728, filed October 27, 1999 ("the '728 Patent Application"). See Filing Receipt of the Present Application, mailed March 15, 2004, at 1; See also Application Data Sheet of the Application, dated December 8, 2003, at 6. Each of the pending claims of the present Application is supported by at

least one of these provisional patent applications filed before July 1999 (*i.e.*, each of the claims of the present Application are supported by at least one of the '917 Patent Application, the '588 Patent Application, and the '287 Patent Application). Thus, each of the pending claims of the present Application has an effective filing date earlier than July 1999.

Applicant understands the Examiner may assert one or more of the rejected claims of the present Application are not fully supported by the provisional applications filed before July 1999 because, in Examiner's view, each of those claims includes a feature not disclosed in the pre-these provisional applications. To the extent such assertions can be made, Applicant notes that any such allegedly missing features of these claims would likewise not be found in *Colomer*. Under such circumstance, *Colomer* would again not be prior art. *See* M.P.E.P. § 715.02.

In light of the foregoing, Applicant respectfully requests that the Examiner withdraw the rejection of Claims 55-57, 64-67, 69, 71, and 73-75 under 35 U.S.C. § 102(a) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as obvious over *Colomer*.

II. REJECTIONS UNDER 35 U.S.C. § 102(b)/ § 103(a) OVER SERAPHIN

Examiner has rejected Claims 58-68, 70, 72 and 74 under 35 U.S.C. § 102(b) as being anticipated by or in the alternative, under 35 U.S.C. § 103(a) as obvious over, Seraphin et al., "Single-Walled Tubes and Encapsulation of Nanocrystals into Carbon Clusters," *J. Electrochem. Soc.*, Vol. 142, No. 1, January, 1995, pp. 290-297, ("*Seraphin*"). Office Action at 3.

Applicant respectfully traverses these rejections. To facilitate prosecution, Applicant has cancelled Claims 58-63, 68, 70, and 72 herein without prejudice, and therefore rejections of these claims are moot.

Anticipation under 35 U.S.C. § 102(b) requires each and every element of the claim to be found within the cited prior art reference. To establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a), three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references

when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *See* M.P.E.P. 706.02(j); *see also In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

Regarding **Claims 64 and 66**, these claims require that “at least 25%” and “at least 50%,” respectively, that “said single wall carbon nanotubes comprise (5,5) single wall carbon nanotubes,” which is not disclosed or suggested by *Seraphin*.

As an initial matter, a (5,5) single wall carbon nanotubes is a particular configuration of single wall carbon nanotubes. The system of nomenclature for single-wall nanotube configurations was defined in M. S. Dresselhaus, G. Dresselhaus, and P. C. Eklund, *Science of Fullerenes and Carbon Nanotubes*, Chap. 19, especially pp. 756-760, (1996), published by Academic Press, 525 B Street, Suite 1900, San Diego, Calif. 92101-4495 or 6277 Sea Harbor Drive, Orlando, Fla. 32877 (ISBN 0-12-221820-5) (“Dresselhaus”). *Seraphin* does not teach or suggest any concentration of any particular conformation of single-wall carbon nanotubes, let alone the particular (5,5) nanotube, at the specified amounts required by Claims 64 and 66 (*i.e.*, “at least 25%” and “at least 50%,” respectively).

Examiner has stated that, because the disclosed diameters of the single-wall carbon nanotubes in *Seraphin* are from 0.7 - 1 nm, the composition of *Seraphin* would inherently possess (5,5) single-wall carbon nanotubes in the amounts specified by Claims 64 and 66, respectively. *See* Office Action, at 4. Applicant does not and cannot concur. Because *Seraphin* is silent about the supposed “inherent” characteristic suggested by Examiner, the Examiner must fill this gap by recourse to extrinsic evidence. *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1269, 20 U.S.P.Q.2d 1746, 1749 (Fed. Cir. 1991). “Such evidence must make clear that the missing descriptive matter is *necessarily* present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.” *Id.* (emphasis added). Moreover, inherency, may not be established by probabilities or possibilities; the mere fact that a certain thing may result from a given set of circumstances is not sufficient to show this feature is present. *Id.*

In the present circumstance, the supposed “inherent” characteristic is not supported by any evidence. Nor can it, as extrinsic evidence supports that this feature is not present in *Seraphin*.

Although *Seraphin* discloses a nanotube diameter, the diameter of a nanotube is generally not indicative of a particular tube configuration. For any given tube configuration, there is a unique diameter, however, *the converse is not true*. In fact, there are a number of (n, m) tube configurations that can produce a tube of a particular diameter or in a particular diameter range. See Iijima, *et al.*, “Single-shell carbon nanotubes of 1-nm diameter,” *Nature*, 363, June 17, 1993, pp. 603-605, (“*Iijima*”), attached as **Exhibit A**. In particular, see hatched areas in Figure 2 of *Iijima*. The hatched areas are indicative of nanotubes with diameters of around 0.8 nm and around 1.05 nm. The particular (n,m) configuration determines the diameter of the single-wall carbon nanotube.

There are many (n,m) configurations that can give similar nanotube diameters, as shown by *Iijima* in Figure 2. Furthermore, single-wall carbon nanotubes of various (n,m) configurations can have very similar diameters. This statement can easily be shown by calculating the diameters of various carbon nanotubes with different (n,m) tube configuration according to the following equation. See *Dresselhaus*, p.760.

$$d_t = \sqrt{3} \ a_{C-C} (m^2 + mn + n^2)^{1/2} / \pi$$

where d_t is the nanotube diameter in Angstroms and
 a_{C-C} is the nearest-neighbor C-C distance (1.421 Å in graphite).

The calculation of diameter has been done for a number of various (n,m) nanotube configurations and the results are tabulated in **Exhibit B**. This demonstrates that a nanotube having a particular (n,m) configuration has a unique diameter, however, there are multiple (n,m) tube configurations that can have approximately the same tube diameters. Hence, a particular diameter of nanotube cannot be equated, *a priori*, to a particular (n,m) tube configuration.

Based upon **Exhibit B**, there are at least 31 different configurations of single wall carbon nanotubes that have calculated diameters between 0.7 nm and 1 nm, of which only one of these 31 configurations is a (5,5) nanotube. Thus, unless a process is specifically tailored to make single-wall carbon nanotubes having preferred (n,m) indices, then for all of the single wall carbon nanotubes in the range of 0.7 to 1 nm, less than 3.2% would be expected to be (5,5) single-wall carbon nanotubes.

To further illustrate this point, Applicant is attaching hereto, as **Exhibit C**, the following non-prior art article: Kim, *et al.*, "Synthesis of Ultralong and High Percentage of Semiconducting Single-walled Carbon Nanotubes," *Nano Lett.*, 2002, Vol. 2, No. 7, 703-708 ("Kim"), which reflects a similar analysis for a different diameter range (0 to 3 nm) of single wall carbon nanotubes. See Kim, at 705, col. 2, and at 706 (including Table 1). This article further strongly supports that, in the absence of special processing parameters and steps to produce compositions having a high level of (5,5) single-wall carbon nanotubes, *Seraphin* would not have produced compositions having an unusually high concentration of (5,5) single-wall carbon nanotubes as required, respectively, by Claims 64 and 66 of the Application. Moreover, *Seraphin*'s silence on this issue suggests that no special processing steps were undertaken or achieved.

Therefore, *Seraphin* does not teach or suggest all the elements of these claims, and, thus, Claims 64 and 66 are neither anticipated by nor obvious over *Seraphin*.

Regarding **Claims 65 and 67**, these claims are dependent upon Claims 64 and 66, respectively, and are not anticipated by or obvious over *Seraphin* for the same reasons that Claims 64 and 66 are not anticipated by or obvious over *Seraphin*.

Regarding **Claim 74**, and to further facilitate prosecution, Applicant has now amended Claim 74 to depend from Claim 73 (now written in independent form). As Claim 73 was not rejected as anticipated by or obvious over *Seraphin*, Claim 74, as amended, is not anticipated by or obvious over *Seraphin*.

Therefore, as a result of the foregoing, Applicant respectfully requests that the Examiner withdraw the rejection of Claims 64-67 and 74 under 35 U.S.C. § 102(b), as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as obvious over *Seraphin*.

III. DOUBLE PATENTING

Examiner has rejected Claims 55-75 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-115 of U.S. Patent No. 6,761,870, (“the ‘870 patent”). Office Action, at 4-5.

Applicant respectfully traverses these rejections. However, to facilitate prosecution of the Application, Applicant hereby responds with the enclosed Terminal Disclaimer to moot these rejections.

IV. AMENDED CLAIMS

Before amendment herein, Claims 69, 71, and 73 were dependent claims that depended from Claims 68, 70, and 72, respectively. As noted above, to facilitate prosecution, Applicant has cancelled, among other claims, 68, 70, and 72 herein without prejudice. Concurrently, Applicant has rewritten Claims 69, 71, and 73 in independent form, and incorporated in the limitations of the independent claims from which each of these claims had previously and respectively depended.

Furthermore, Claims 74 and 75 had depended from independent Claim 72. Applicant has amended these claims to now depend from Claim 73, which is now in independent form.

V. CONCLUSION

As a result of the foregoing, it is asserted by Applicant that the Claims in the Application are now in condition for allowance, and Applicant respectfully requests allowance of such Claims. Applicant respectfully requests that the Examiner call Applicant’s attorney at the below listed number if the Examiner believes that such a discussion would be helpful in resolving any remaining problems.

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Respectfully submitted,

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